Historical Perspectives on Soil Loss

Francisco J. Arriaga[1] and Greg Andrews[2]
1-Assistant Professor, Dept. of Soil Science, UW-Madison
2-Professor, Agriculture Agent and Department Head, UW-Extension Pierce County

Wisconsin Crop Management Conference
Madison, WI
January 16, 2012

UW Extension
University of Wisconsin–Extension

DEPARTMENT OF
Soil Science
UNIVERSITY OF WISCONSIN–MADISON


(http://www.zmescience.com)

Soil Erosion **was** a Problem

Providence Canyon

(http://www.thebluetrail.com)

The Dust Bowl

- Started around 1931 due to severe droughts
- Number of storms in 1932: 14
- Number of storms in 1933: 38
  - Franklin Roosevelt takes office
  - Soil Erosion Service (SES) starts Sept. 13

(http://www.english.illinois.edu/maps/depression/dustbowl.htm)

The Dust Bowl

- In 1934 drought covers 75% of the country, affecting 27 states severely
- Worst dust storm, Black Sunday, occurs in 1935
- Foundation for the soil conservation districts program passed in 1936
- In 1937 the Shelterbelt Project begins (trees planted across the Great Plains to protect the soil from erosion)
- Several conservation approaches in combination helped reduce wind erosion by 65% in 1938
- Rains bring an end to the drought in 1939

(http://www.english.illinois.edu/maps/depression/dustbowl.htm)

Early Conservation Work in WI

- The 1st specific recommendations to control wind erosion damage were made by F.H. King in the late 1800's.

- For the Plainfield sand area King recommended
  - tree shelter-belts in north and west side of fields
  - cropping fields to alternate strips of dense growing and open crops
  - "Destructive Effects of Winds on Sandy Soils and Light Sandy Loams, and Methods of Protection", published in October 1894

(Zeasman and Hembre. A Brief History of Soil Erosion Control in Wisconsin, 1963)

Early Conservation Work in WI

- Professor O.R. Zeasman pioneered erosion control started in 1922
  - Gully control in Buffalo County (20 to 50ft deep)
  - Introduced diversion terraces
  - Soil Conservationist appointment jointly with SCS and UW-Extension starting in 1936
  - Introduced air tours to provide aerial view of erosion damages to farmers

(Zeasman and Hembre. A Brief History of Soil Erosion Control in Wisconsin, 1963)

Coon Creek Watershed Project

- Established in 1933 by SES (later SCS and then NRCS) to demonstrate the value of soil conservation practices.
- From late 1933 until 1935 418 of the 800 farmers in the valley signed cooperative agreements.
- Practices started to spread to other areas
- Trimble and Lund (1982) estimated a 75% reduction in erosion in 48 years, with only a 6% reduction in cropland. Trout returned to area streams.

("Coon Valley, Wisconsin: A Conservation Success Story" by Douglas Helms)

WI Accomplishments 1937-1962

- 71 conservation districts (35,017,600 acres)

Practice	Amount
Contour strip cropping	1,1069,013 acres
Terraces	3,885 miles
Diversions	2,370 miles
Land smoothing	14,369 acres
Tile drains	6,520 miles
Pasture/hay renovation	349,815 acres
Tree planting	151,251 acres
Windbreaks	4,496 acres
Wildlife wetland development	18,006 acres
Hedgerow planting	711 miles

(Zeasman and Hembre. A Brief History of Soil Erosion Control in Wisconsin, 1963)

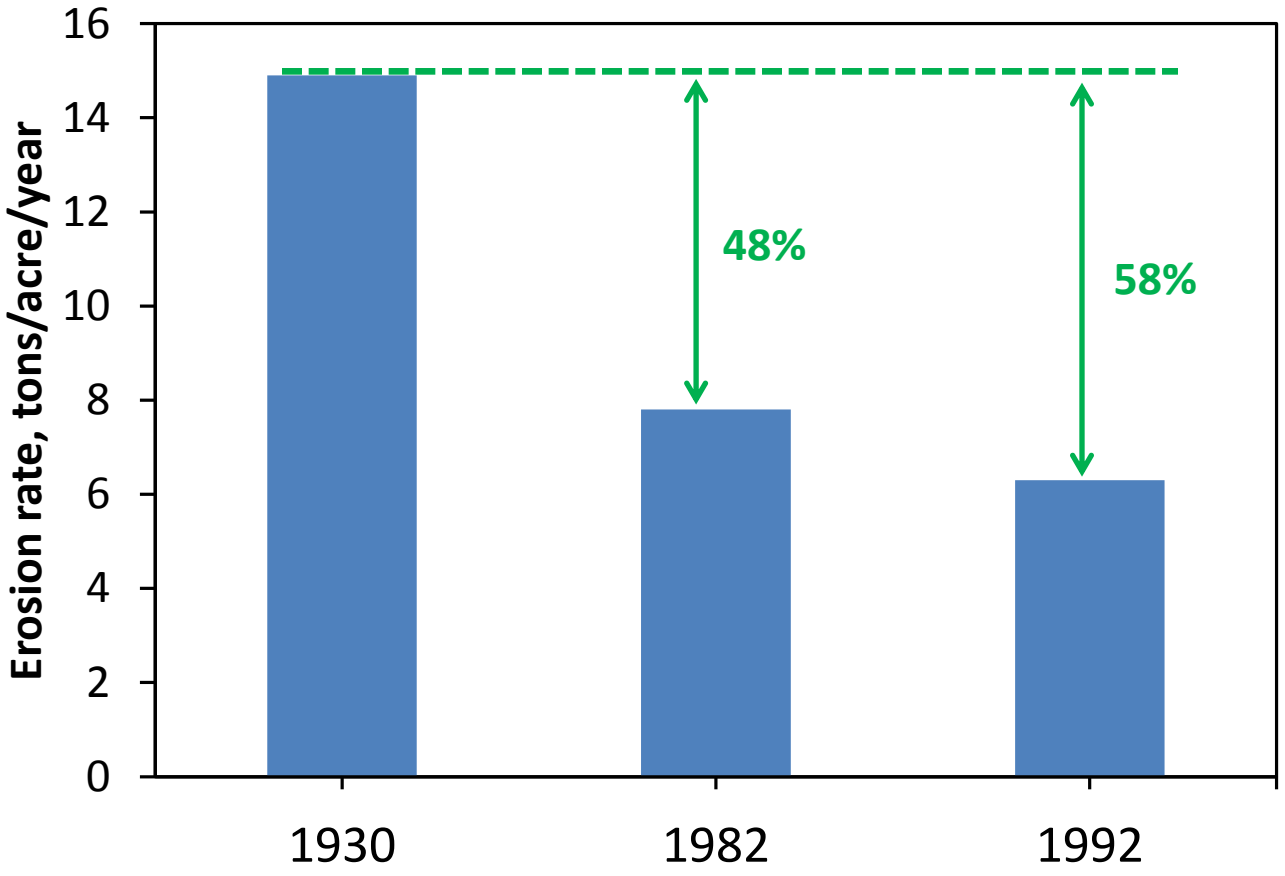
Soil Erosion ~~was~~ a Problem **IS**

Maiden Rock, WI circa 1975

Cropland Erosion Rate

Five County Area in IA, MN & WI

Clayton (IA); Houston and Winona (MN); Crawford and Vernon (WI)



(Historical Change in Soil Erosion, 1930-1992: The Northern Mississippi Valley Loess Hills, USDA-NRCS, 1996)

Soil Erosion **IS** a Problem

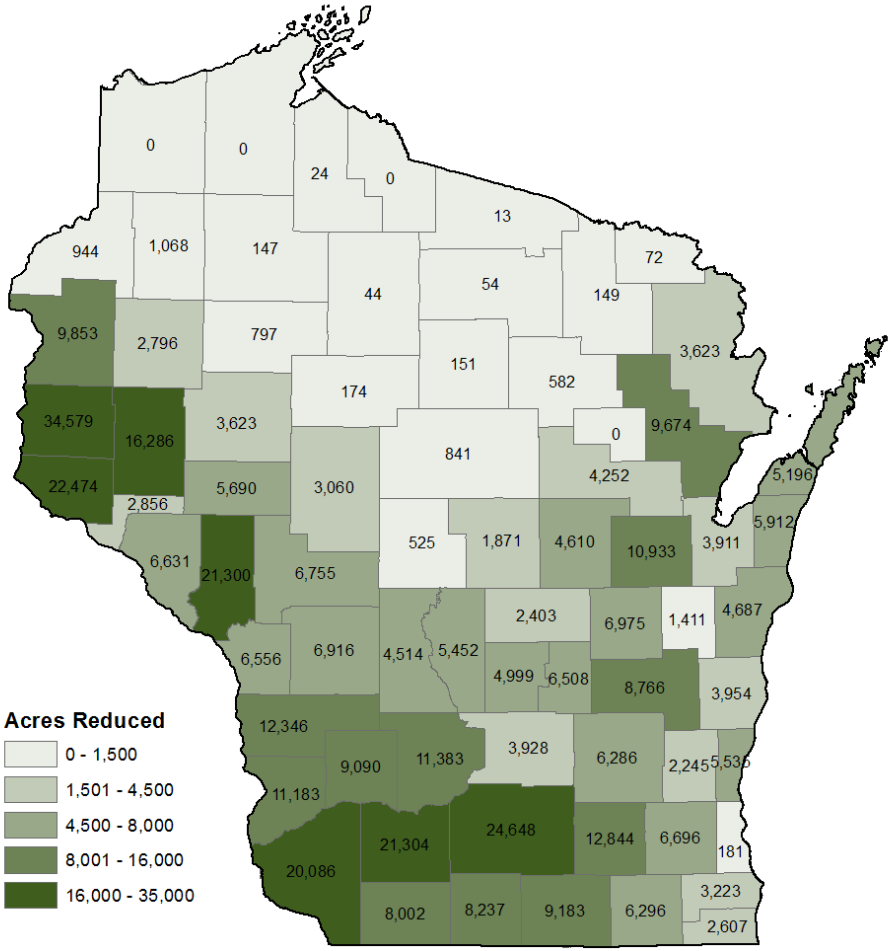
May 7, 2012

June 16, 2012

May 2, 2012

May 2, 2012

Reduction in CRP Acreage (Oct. 2012)



(Data were provided by Scott Walter, Wisconsin DNR)

Soil erosion continues to be a problem.

What can be done?

Soil Erosion Management Practices

- Contour planting
- Contour buffer strips
- Terraces
- Grassed waterways
- Riparian buffers

- No-till and reduced tillage
  - Cover crops

Erosion Management Practices

Contour strips
Crawford Co.

Courtesy: R.P. Wolkowski

Erosion Management Practices

Contour buffer strips
Chippewa Co.

Courtesy: R.P. Wolkowski

Erosion Management Practices

Terraces
Grant Co.

Courtesy: R.P. Wolkowski

Erosion Management Practices

Riparian buffer
Waupaca, Co.

Courtesy: R.P. Wolkowski

Erosion Management Practices

Grass waterway
Grant Co.

Courtesy: R.P. Wolkowski

Crop residue is still the farmer's best erosion prevention tool

- ✓Reduced detachment
- ✓Hinders overland flow
- ✓Improved infiltration

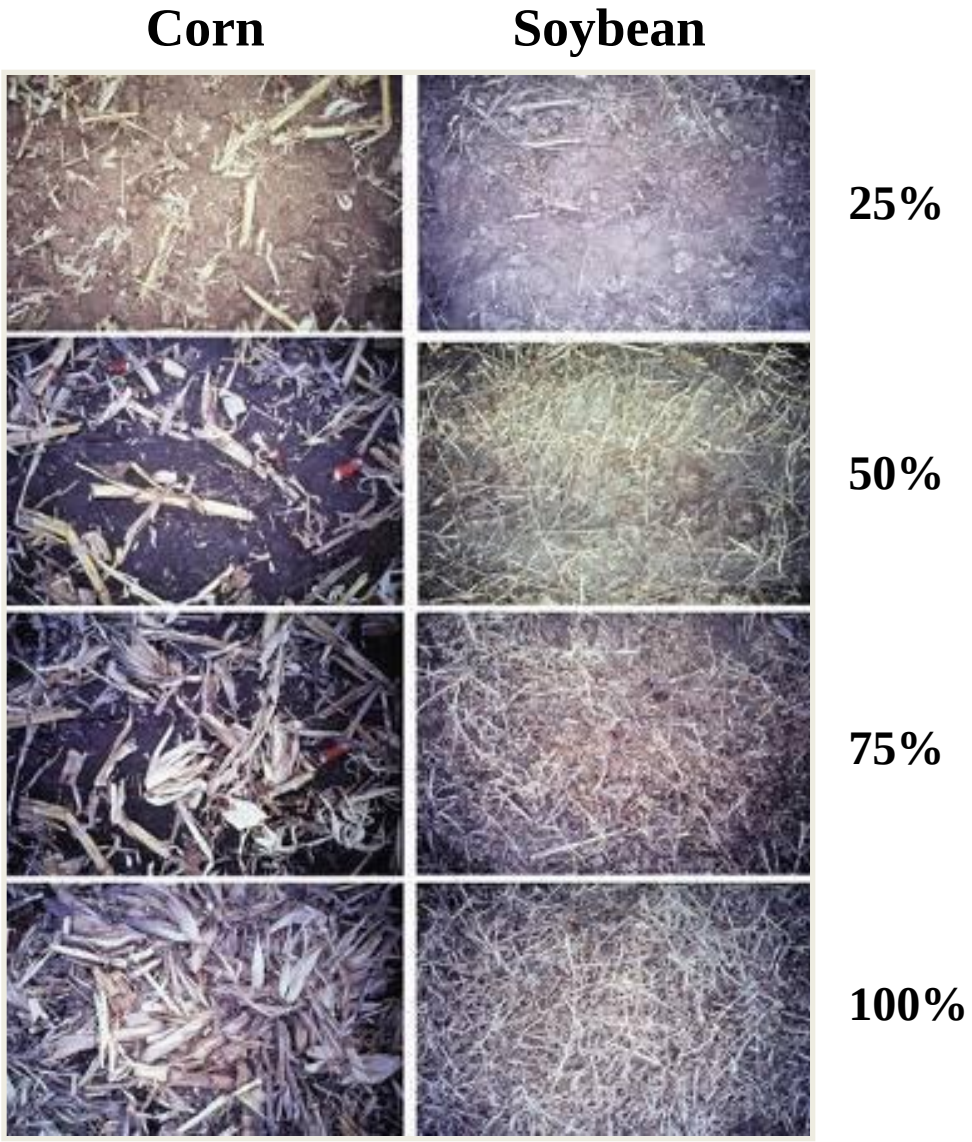
Courtesy: R.P. Wolkowski

Strip tillage offers compromise between full width tillage and no-till

Courtesy: R.P. Wolkowski

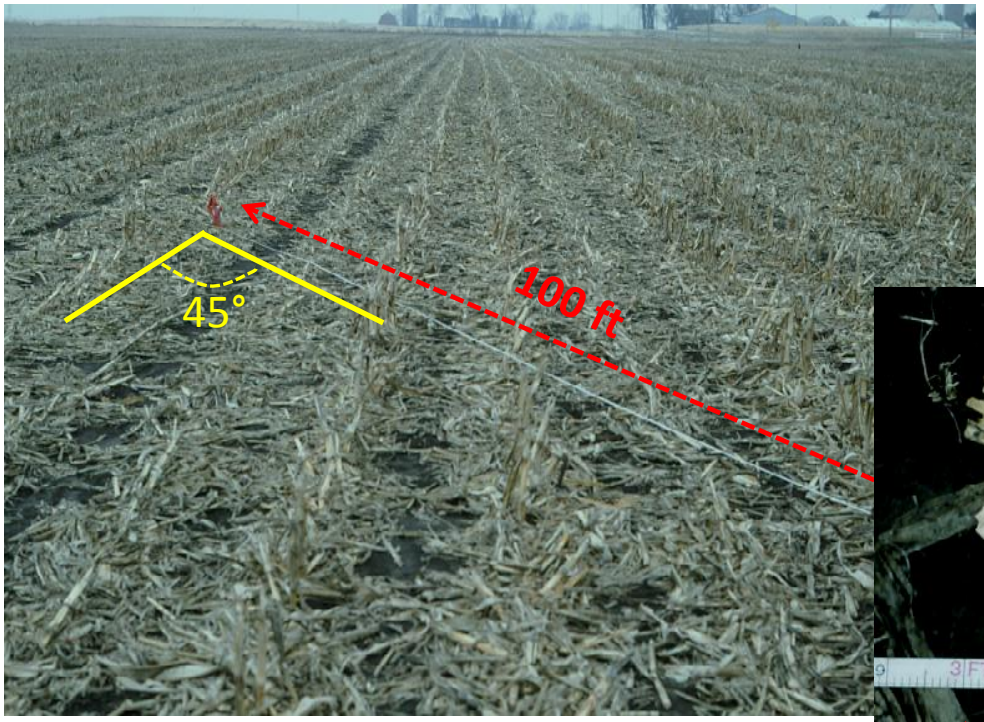
Crop Residue Cover

- Conventional Tillage
  - (<15% residue)
- Reduced Tillage
  - (15-30% residue)
- Conservation Tillage
  - (>30% residue)



Line Transect Method of Measuring Residue

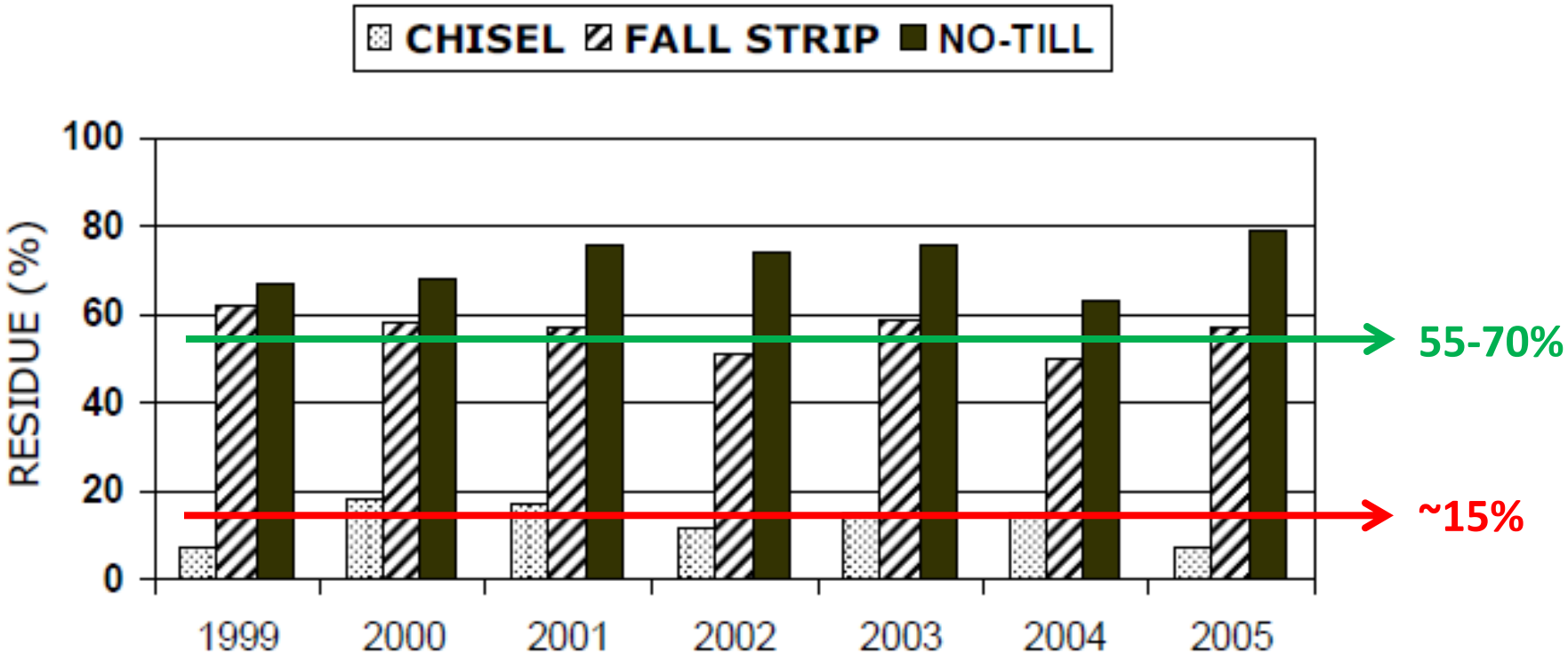
Stretch tape diagonally



Count "hit" per tape length

Courtesy: R.P. Wolkowski

Surface Residue in Corn After Soybean

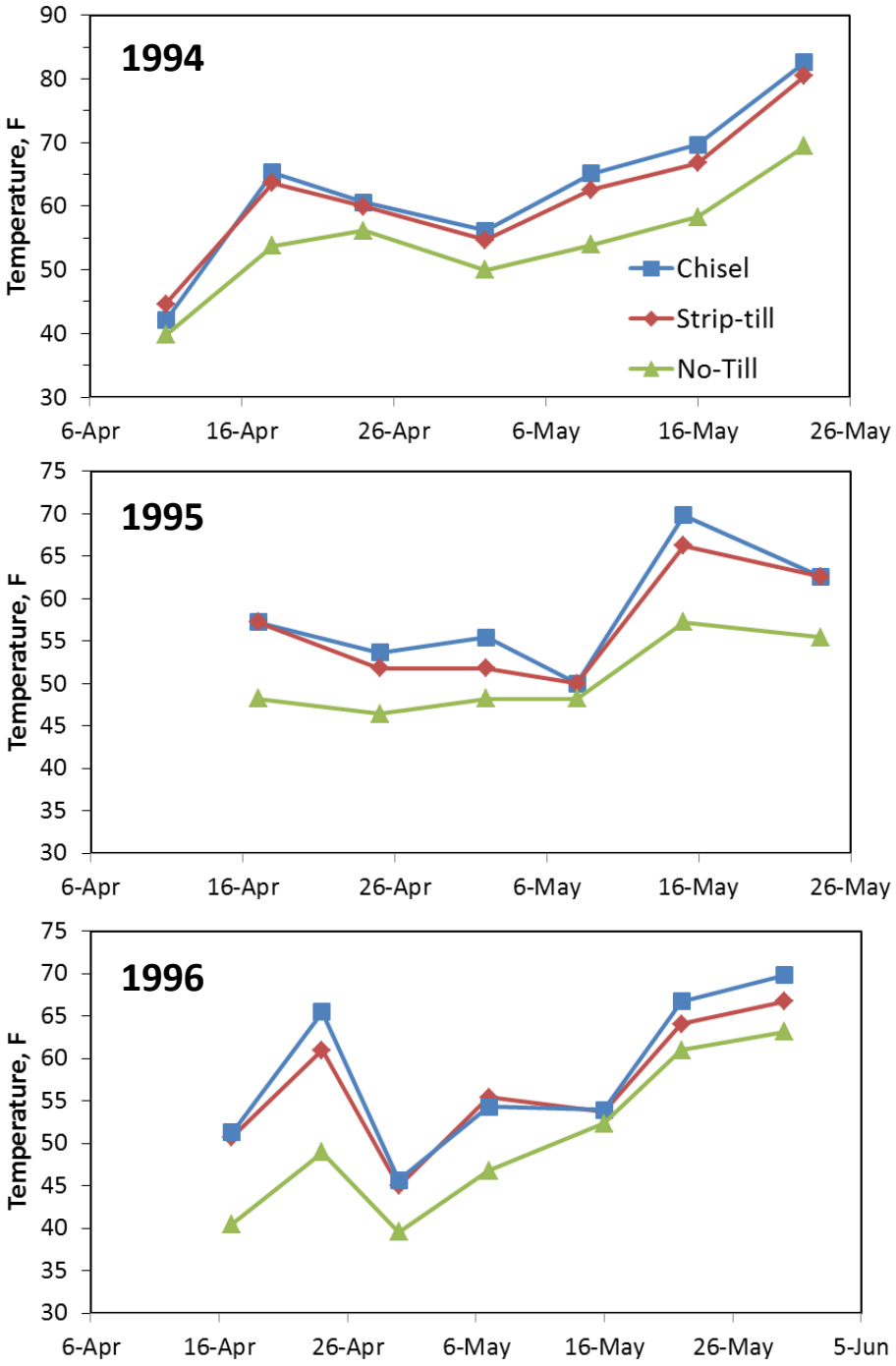


(NHSS issue #2 2008, Wolkowski, Cox and Leverich)

Soil Temperature & Tillage

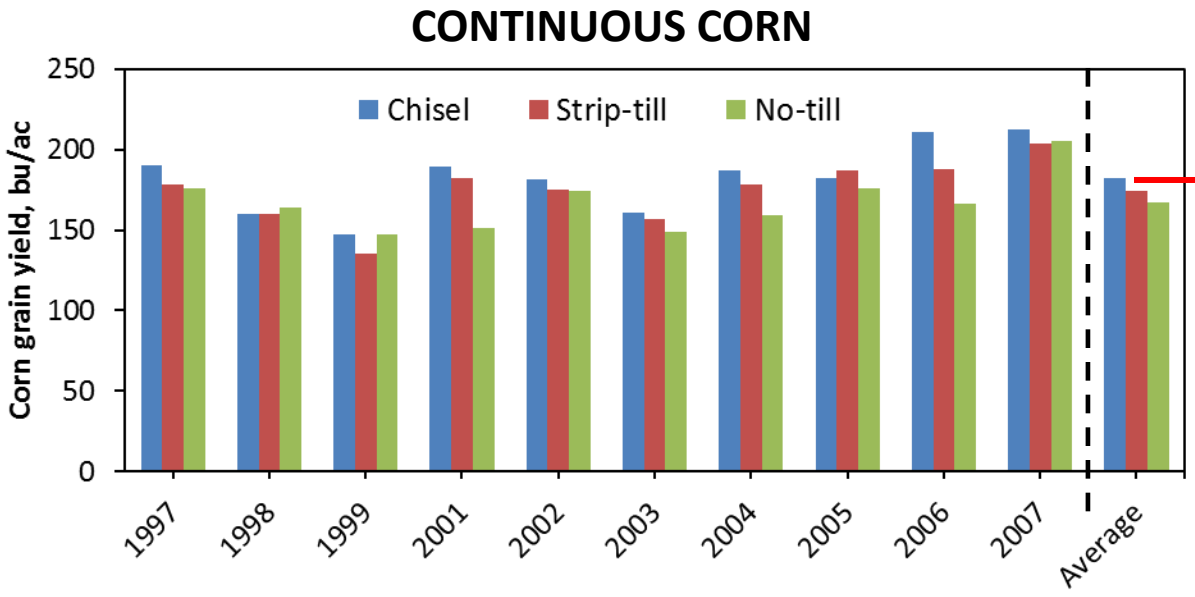
Measured at a 2” Depth
between 4:00-5:00pm
in Arlington, WI

- On average, soil temperature under no-till was 6 to 8°F cooler.
- In other words, it took approx. 1 week longer for temps. in no-till get above 60°F.
- Minimal use of row cleaners in this case.

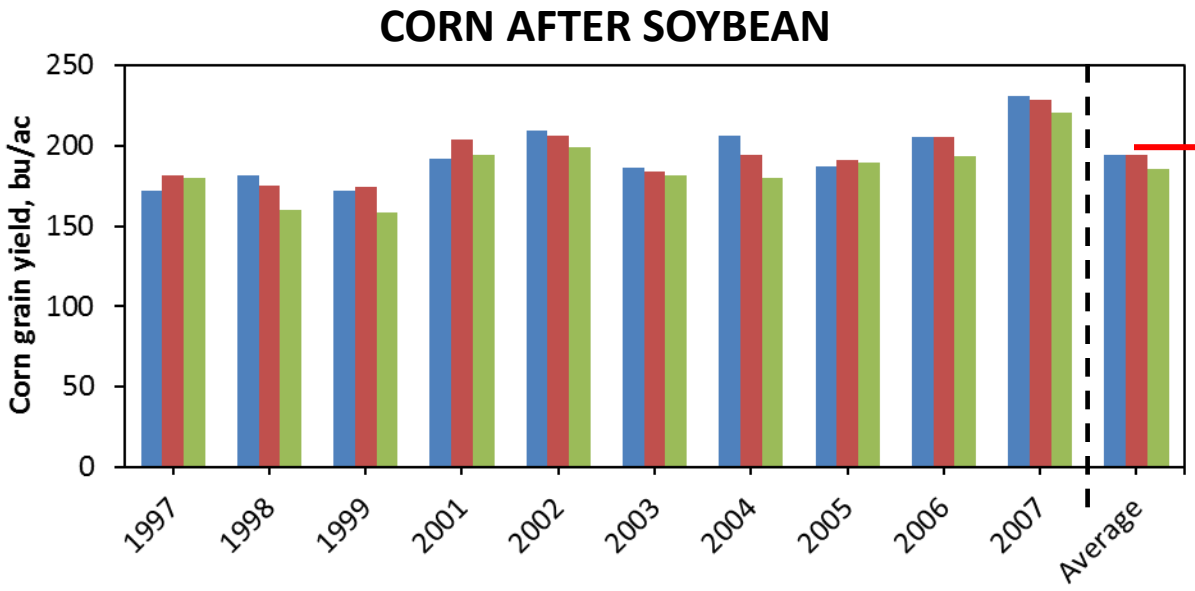


Courtesy: R.P. Wolkowski

Corn Yield 1997-2007



Yields with Chisel:
4% > Strip-till
8% > No-till



Yields with Chisel:
= Strip-till
5% > No-till

(NHSS issue #2 2008, Wolkowski, Cox and Leverich)

System	Corn Yield *	Cost per acre	Cost per bu
CONTINUOUS CORN			
Chisel	182.0	$ 463.85	$ 2.55
Strip-till	174.4	$ 440.65	$ 2.53
No-till	166.7	$ 437.95	$ 2.63
Difference from Chisel			
Strip-till	-7.6	-$ 23.20	-$ 0.02
No-till	-15.3	-$ 25.90	$ 0.08
CORN AFTER SOYBEAN			
Chisel	194.1	$ 463.85	$ 2.39
Strip-till	194.2	$ 440.65	$ 2.27
No-till	185.4	$ 437.95	$ 2.36
Difference from Chisel			
Strip-till	0.1	-$ 11.20	-$ 0.12
No-till	-8.7	-$ 25.90	-$ 0.03

* - yield is an average from 1997-2007.

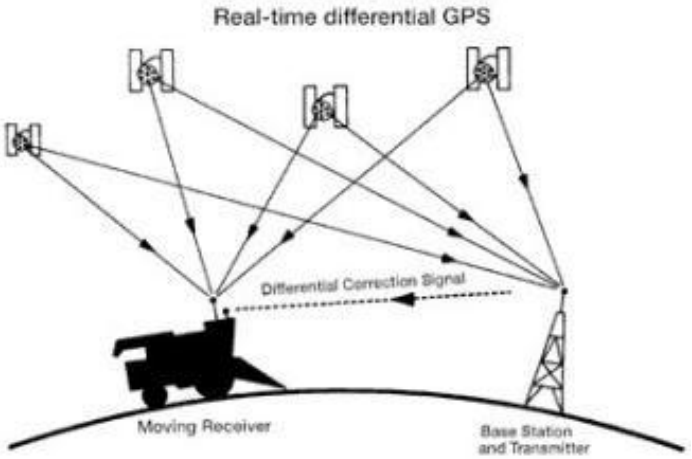
(NHSS issue #2 2008, Wolkowski, Cox and Leverich)

New Technologies

- Better equipment designed to handle residue
- Precision agriculture tools, such as auto-steer, VRT controls, etc.
- New crop varieties more resistant to drought, heat, and pest pressure

Precision Agriculture Tools

- **GPS and precision agriculture tools have facilitated the establishment, maintenance, and record keeping of soil conservation practices**
  - System of satellites controlled by Dept. of Defense (DOD)
  - Fast, accurate, on-the-go positioning
  - Reliable and consistent
  - Different corrections depending on needs



How Does the Future Look?

- At the December 2012 Wisconsin Farm Bureau Federation Annual Meeting and Conference in WI Dells two key policy decisions were made:
  - Wisconsin Farm Bureau reaffirmed its policy to support cross-compliance between federally subsidized crop insurance and conservation compliance under Federal Farm Bill legislation. *Wisconsin Farm Bureau also honors 4 members each year with their Aldo Leopold conservation award program.*
  - Wisconsin Farm Bureau also reaffirmed its support for base funding by the Wisconsin Department, Trade and Consumer Protection agency (WDATCP) to County Land Conservation Departments.

Closing Remarks

- Many challenges have been conquered, but hurdles still exist in soil erosion control.
- Lessons can be learned from history as we look at the present and into the future.
- “Older” techniques are still useful and very effective in controlling soil erosion, however new opportunities, needs, and circumstances should be kept in mind as we continue the constant fight against soil erosion.

Thank you!

“Not until tillers of soil grew more food than they themselves required were their fellows released to do other tasks than the growing of food—that is, to take part in a division of labor that became more complex with the advance of civilization.”

Conquest of the Land Through Seven Thousand Years, W. C. Lowdermilk, c.1953